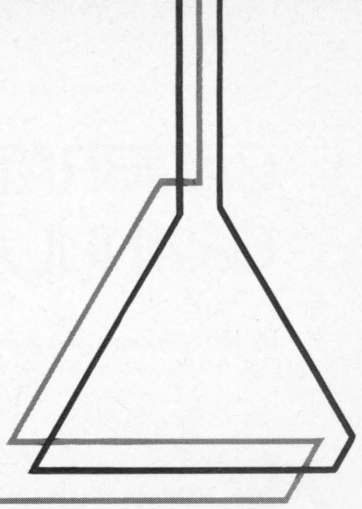


CALIBRATING and ADJUSTING GRANULAR ROW APPLICATORS

by John Siemens

UNIVERSITY OF ILLINOIS, URBANA-CHAMPAIGN • COLLEGE OF AGRICULTURE • COOPERATIVE EXTENSION SERVICE

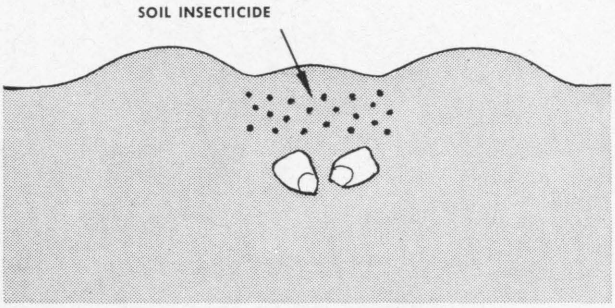
CIRCULAR 1008

CALIBRATING AND ADJUSTING GRANULAR ROW APPLICATORS

by John Siemens, Associate Professor of Agricultural Engineering

GRANULAR CHEMICALS for weed or insect control must be applied with precision. This is particularly true of pre-emergence herbicides and soil insecticides. Application of less than the recommended rate may result in ineffective control; application of more than the recommended rate can be costly or may injure the present crop or subsequent crops. To meet these rigid requirements, you must calibrate the application equipment carefully.

Both herbicides and insecticides may be broadcast before planting or applied after planting. It is common, however, to apply these chemicals in a band over the row by attaching applicators to the planter. This reduces the amount of material used and thus lowers costs.



Apply soil insecticides in a band over the seed and cover with a shallow layer of soil.

A hose attached to the back of the planter runner can be used for applying Aldrin and Heptachlor.

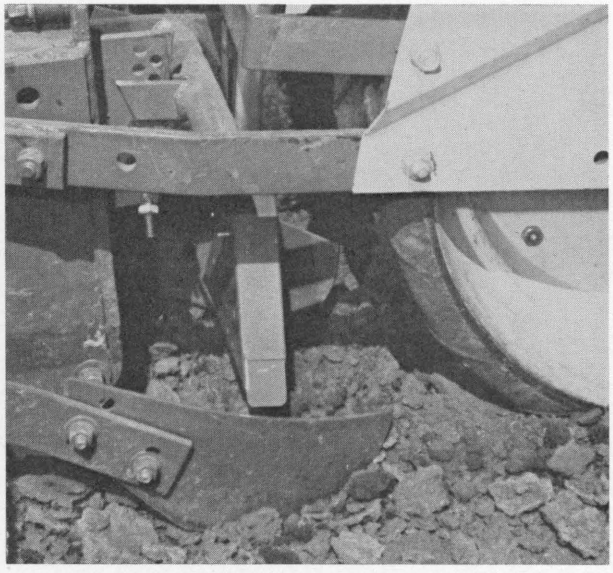
Proper Placement of Granules

Soil insecticides such as Aldrin and Heptachlor should be placed in a narrow band over the seed and covered with a shallow layer of soil. Other soil insecticides (like BUX ten, Dasanit, Diazinon, Dyfonate, Furadan, Landrin, and Thimet) should be placed in a 7-inch band ahead of the planter press wheel. The press wheel will usually incorporate the insecticide into the soil satisfactorily.

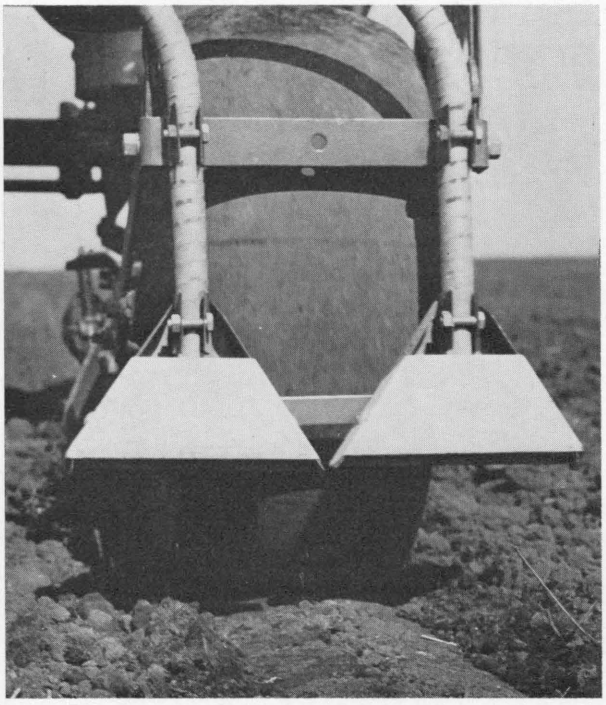
Herbicides are usually placed in a 12- to 14-inch band over the row. The band should be wide enough to cover the ridges of soil left by the press wheel.

Factors Affecting Application Rate

Most granular applicators use gravity flow with a rotating agitator for metering the granules through an adjustable orifice. Several factors can cause a



Use a spreading device for applying insecticides that need to be in a 7-inch band.



A spreading device for applying granules.

variation in the application rate, including the following:

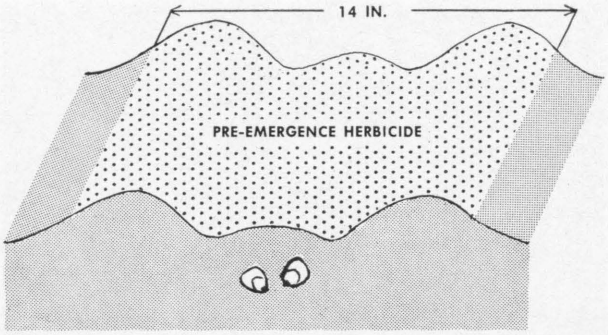
1. Exposed area of the metering orifices
2. Speed of the agitator
3. Ground speed of the applicator
4. Nature and size of the granules
5. Roughness of the field
6. Humidity
7. Temperature

Variation in Size and Density of Granules

Many granules may look somewhat alike at first glance, but there is wide variation in the size and density of the particles and in the nature of the inert carrier for the chemicals. For these reasons, a different applicator setting may be necessary for each chemical applied. A different setting may even be required for the same chemical formulated by two different manufacturers or in two batches by the same manufacturer.

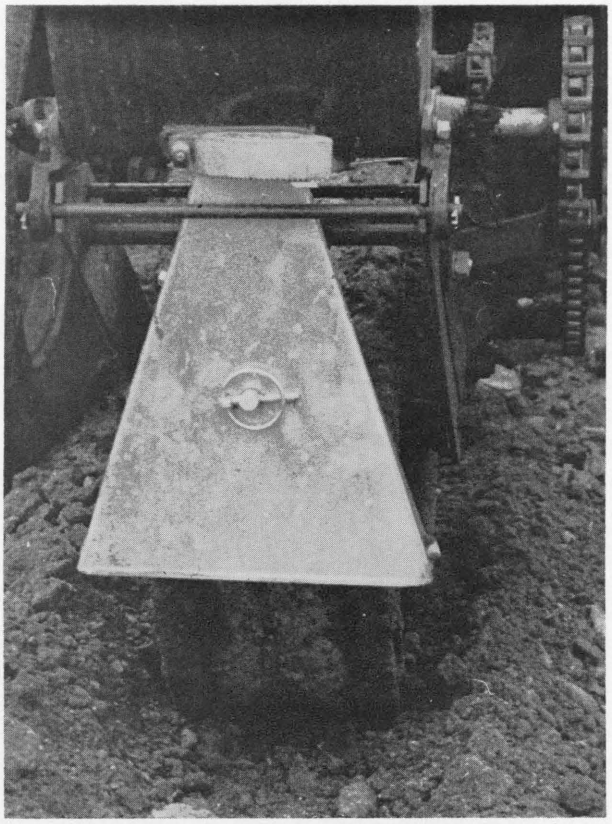
Check and Maintain Ground Speed

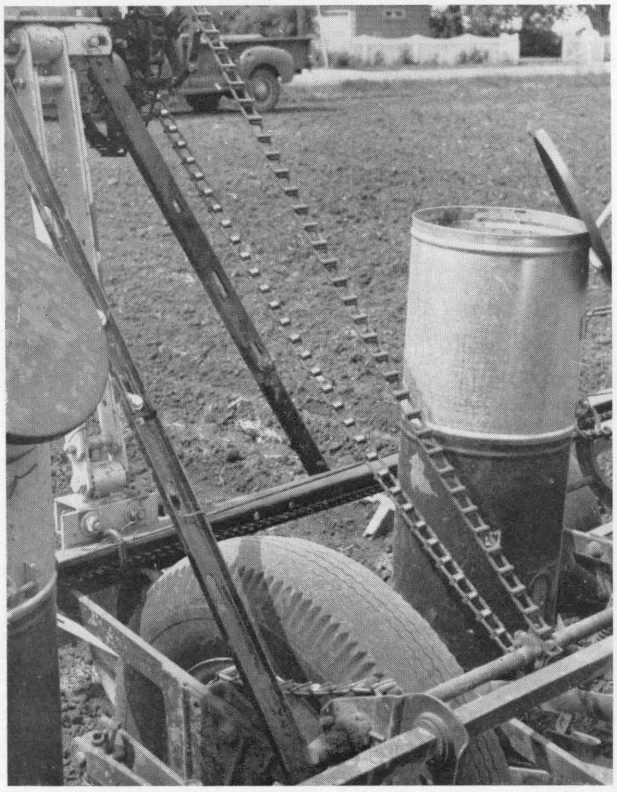
Except for the orifice setting, ground speed is the most significant factor affecting the application rate. Speed should be checked carefully in the field where the chemicals will be applied. One method is to set markers 176 feet apart and check the time (in seconds) required to drive between them. Each check should be made with a running start. To



Apply pre-emergence herbicides in a 14-inch band over the row.

Some typical equipment for applying granular herbicides and soil insecticides.





The metering devices in the bottom of the hoppers may be driven from the seed-plate drive (right), press wheel (top), or fertilizer shaft (bottom, left).

determine the speed in miles per hour, divide 120 by the traveling time in seconds. Some examples are given in the following table.

Time required to drive 176 feet (seconds)	*Speed (miles per hour)*
60	2
40	3
30	4
24	5
20	6
17	7

Once you have established and checked the field speed, *keep the speed uniform during the application.*

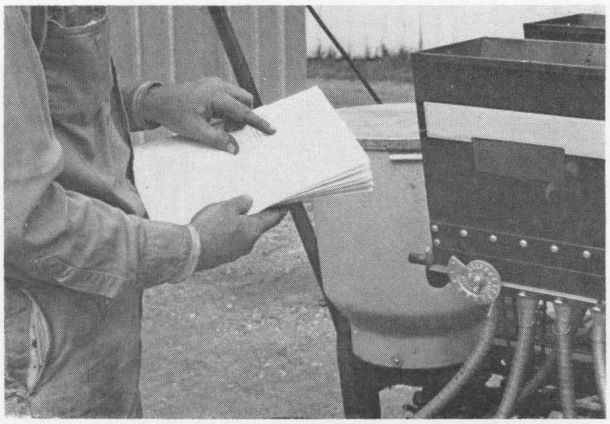
Even though all granular applicators use a rotating agitator that varies with ground speed, the flow of the granules through the orifice is not necessarily proportional to speed. It is not uncommon to find a 100-percent variation in the application rate with a speed change of 1 mile per hour.

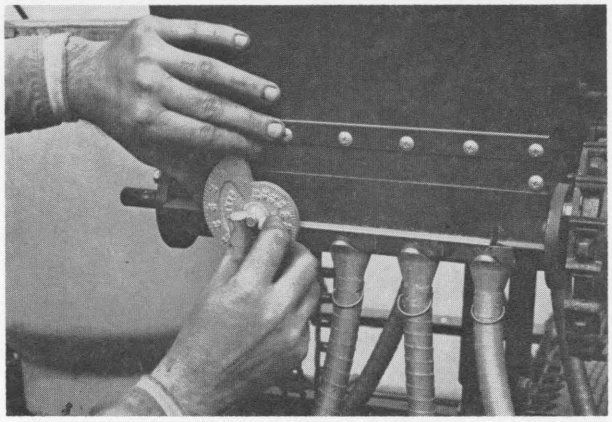
The factors that affect application rate can vary from one day to the next or from one field to another. For this reason, you should check the application rate often so that you can make the necessary adjustments to obtain the proper application rate.

Follow Suggestions on Label and in Manual

Read the container label carefully to determine the percent of active ingredients in the granules and the recommended application rate. Most of the recommended application rates for insecticides and herbicides are based on 40-inch row spacings.

Check the operator's manual for the applicator to determine the orifice setting needed to apply the recommended rate for the granules to be used. Although the settings given in the manual are usually





To adjust applicator, follow instructions on container label (top); then check operator's manual for suggested orifice setting (top right) and set dial indicators on hoppers (bottom right).

reliable you should always make a field check to insure accuracy.

Granules contain a certain percentage of active ingredients. The remainder is an inert material used to make enough bulk that the granules can be applied accurately. The following table shows the number of pounds of granules to apply per acre according to the composition of the granules and recommended rate of active ingredients.

If percent of active ingredients in granules is	*And recommended rate of active ingredients is*	*Then apply this amount of granules*
5 percent	½ pound per acre	10 pounds per acre
5 percent	1 pound per acre	20 pounds per acre
5 percent	1½ pounds per acre	30 pounds per acre
5 percent	2 pounds per acre	40 pounds per acre
5 percent	3 pounds per acre	60 pounds per acre
5 percent	4 pounds per acre	80 pounds per acre
10 percent	½ pound per acre	5 pounds per acre
10 percent	1 pound per acre	10 pounds per acre
10 percent	1½ pounds per acre	15 pounds per acre
10 percent	2 pounds per acre	20 pounds per acre
10 percent	3 pounds per acre	30 pounds per acre
10 percent	4 pounds per acre	40 pounds per acre
20 percent	½ pound per acre	2½ pounds per acre
20 percent	1 pound per acre	5 pounds per acre
20 percent	1½ pounds per acre	7½ pounds per acre
20 percent	2 pounds per acre	10 pounds per acre
20 percent	3 pounds per acre	15 pounds per acre
20 percent	4 pounds per acre	20 pounds per acre
25 percent	½ pound per acre	2 pounds per acre
25 percent	1 pound per acre	4 pounds per acre
25 percent	1½ pounds per acre	6 pounds per acre
25 percent	2 pounds per acre	8 pounds per acre
25 percent	3 pounds per acre	12 pounds per acre
25 percent	4 pounds per acre	16 pounds per acre

Amount of Material Required for Different Row Spacings

If your applicator is adjusted to apply the correct rate for 40-inch rows, it will also apply the correct rate for other row spacings. Whatever the row spacing, the rate of application along the row remains the same. But the total amount of material required to cover an acre of a field will vary with the row spacing. You can determine the total amount needed for your row spacing from the table below.

Broadcast rate (lb./A.)	*Band rates (lb./A.) when row spacing is*				
	40 in.	*38 in.*	*36 in.*	*30 in.*	*20 in.*
3	1	1.1	1.1	1.3	2
6	2	2.1	2.2	2.7	4
9	3	3.2	3.4	4.0	6
12	4	4.3	4.5	5.3	8
15	5	5.3	5.6	6.7	10
18	6	6.4	6.8	8.0	12
21	7	7.5	7.9	9.3	14
24	8	8.5	9.0	10.7	16
27	9	9.6	10.1	12.0	18
30	10	10.7	11.2	13.3	20
33	11	11.7	12.4	14.7	22
36	12	12.7	13.5	16.0	24
39	13	13.8	14.6	17.3	26
42	14	14.9	15.8	18.7	28
45	15	16.0	17.0	20.0	30
48	16	17.0	18.0	21.3	32

Suppose, for example, that you want to apply an insecticide in a band with 30-inch rows. The recommended application rate is 10 pounds per acre for banding in 40-inch rows. Consulting the table, you find that you will need 13.3 pounds of material to cover an acre at the proper rate.

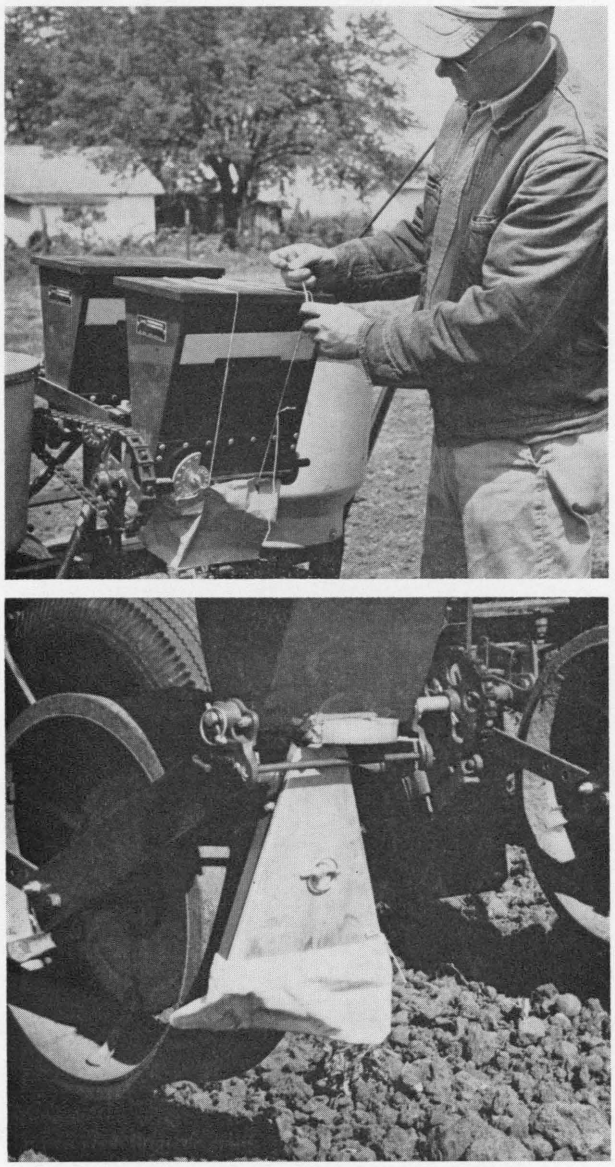
Make a Field Check of the Application Rate

Once you have set the applicators for applying the proper amount of materials, make a field check for each hopper. You can do this in several ways. One method is to make a round or two in the field with the seed-corn boxes removed from the planter. Paper, plastic, or cloth bags can be used for collecting the granules from each hopper. The granules collected can be weighed or checked with a calibrated measure. This process should be repeated until the desired rate is obtained from each hopper.

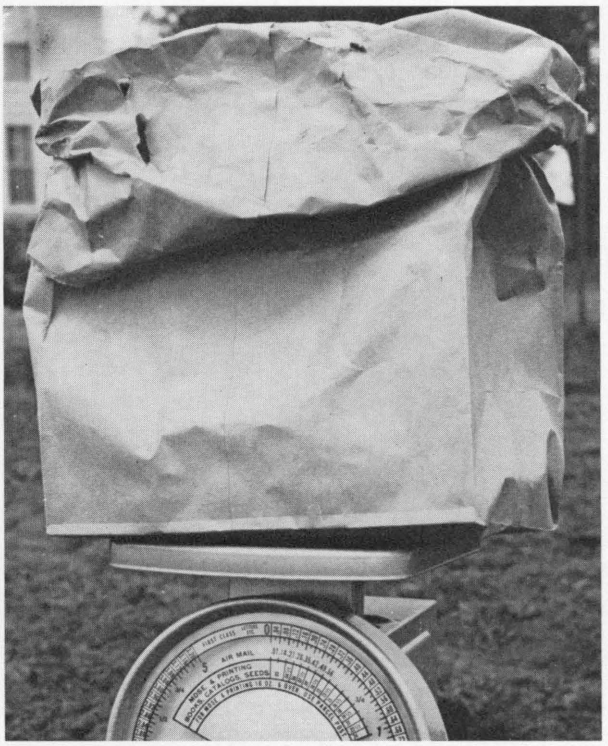
Another method that is less accurate but still acceptable is to proceed with the planting and check the exact amount dispensed through each hopper. The disadvantage of this method is the possibility of not having the proper application rate on the calibrating rows. In either case, it is necessary to know the acreage covered. The numbers of rows per acre for various row spacings and lengths are listed below.

	Rows per acre when row spacing is				
Length of row	*20 in.*	*30 in.*	*36 in.*	*38 in.*	*40 in.*
330 feet	79.6	52.8	44.0	41.8	39.6
660 feet	39.4	26.4	22.0	20.9	19.8
990 feet	26.4	17.6	14.6	13.9	13.2
1,320 feet	19.8	13.2	11.0	10.4	9.9
1,650 feet	15.8	10.6	8.8	8.3	7.9
1,980 feet	13.2	8.8	7.3	7.0	6.6
2,310 feet	11.2	7.6	6.3	6.0	5.6
2,640 feet	9.8	6.6	5.5	5.2	4.9

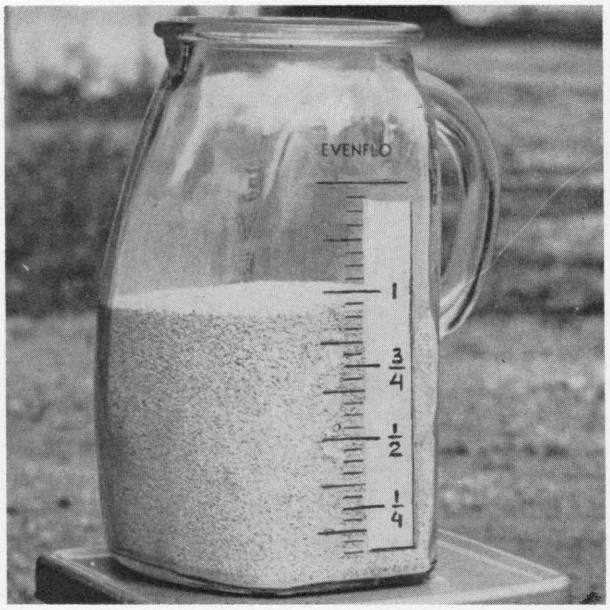
If you know how many pounds of material have been used on a given number of rows, you can use



To make an accurate calibration in the field, collect granules in a paper sack (top) or cloth sack (bottom). Check amount collected against recommended rates for acreage you have covered.



You can determine the amount of granules collected during the calibration run by weighing, or with a calibrated measure like that shown at the top of the next column.



This measure was adapted for specific granules by placing a tape along the original calibrations and marking it off in ¼-pound increments.

the following formula to determine the application rate in pounds per acre of field:

$$\frac{\text{Rows per acre} \times \text{pounds used}}{\text{rows covered}} = \text{application rate}$$

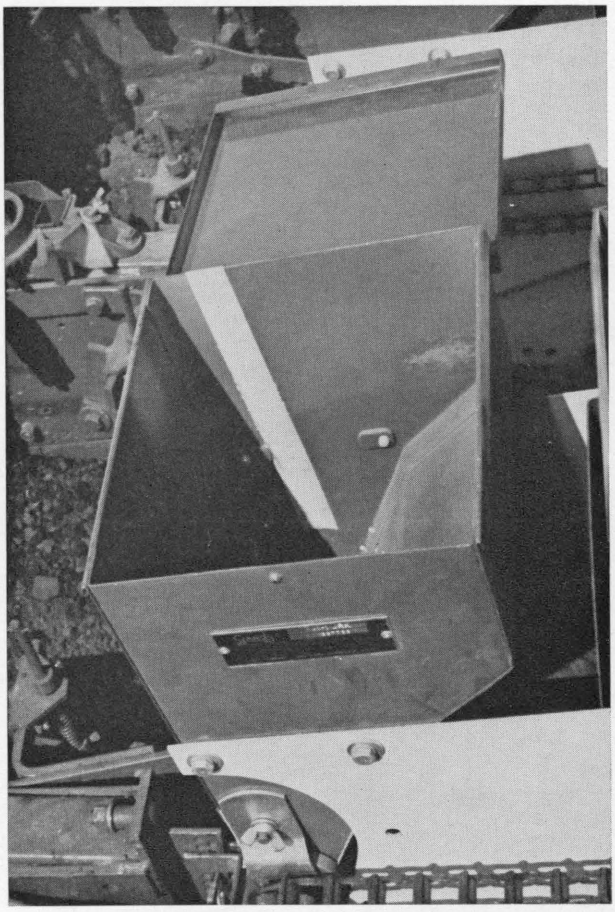
Suppose, for example, that you are applying a pre-emergence herbicide and find that 8 pounds have been applied on sixteen 40-inch rows 1,320 feet long. Applying the above formula, you have:

$$\frac{9.9 \text{ (from the table)} \times 8}{16} = 4.95 \text{ pounds per acre of the field}$$

To obtain the application rate in the band, multiply row spacing by the pounds per acre of the field, and divide by the band width. Assuming a band width of 14 inches in the above example, we get this result:

$$\frac{40 \times 4.95}{14} = 14.1 \text{ pounds per acre of band}$$

As stated earlier, the application rate can vary from one day to the next or from one field to another. A simple method of regularly checking the application rate of each applicator is to place a strip of masking tape vertically on the inside of the applicator hopper. Then fill the hopper in increments of 1 or 2 pounds. After each increment is added, shake the hopper to settle the material, and mark the tape at the level of the chemical. Throughout the planting season, the application rate can be checked by simply reading the level of the chemical before and after planting a number of rows. The formulas and table in this section can be used to get the application rate in pounds per acre.



For checking the application rate throughout the growing season, a strip of masking tape can be placed inside each hopper and marked off in 1- or 2-pound increments.

This procedure will also help to get all applicators set at the same rate.

Adjustment of Applicator

Raising or lowering the spreaders will change the width of the band. This is especially important in applying herbicides. The height should be regulated until the band extends beyond the press-wheel ridges (usually 14 inches).

On some applicators a flexible metal hose carries the granules from the hopper to the spreaders. This hose may be too long for even flow at all times. As a result, the application rate will usually vary along the row. This problem can be eliminated by cutting off part of the hose. It is best to cut off a small amount at a time until the hose is the proper length to provide uniform flow.

This circular replaces Circular 839 of the same title.

Urbana, Illinois

December, 1969

Issued in furtherance of Cooperative Extension Work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture.
JOHN B. CLAAR, Director, Cooperative Extension Service, University of Illinois at Urbana-Champaign.

10M—12-69—12282